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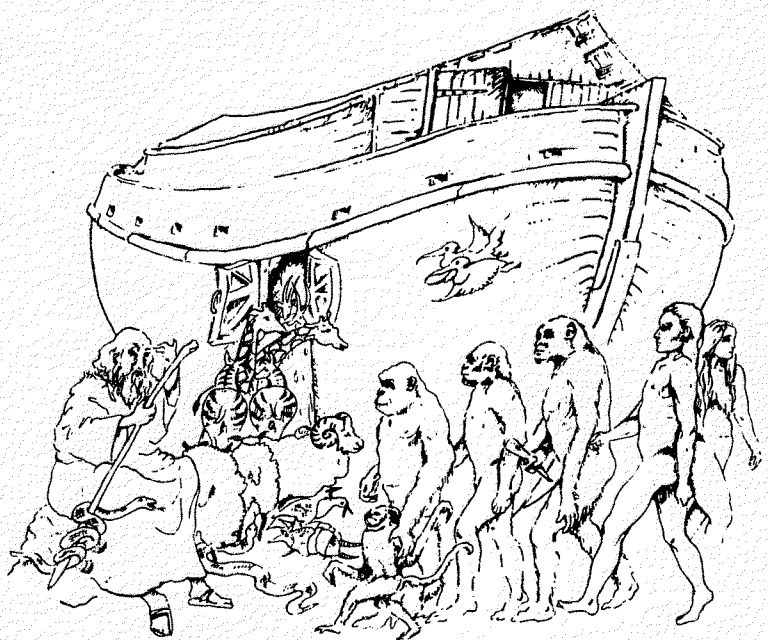

Issue VI

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FORTHCOMING SYMPOSIA

Fall Science Conference of the Metropolitan Detroit Science Teachers Association and the Detroit Area Council of Teachers of Mathematics. November 14, 1981, at Lakeview High School, St. Clair Shores, Michigan. One of the sessions at this conference will be devoted to the creation-evolution controversy.

University of Minnesota Conference on "Evolution and Public Education." December 5, 1981, at the Earle Brown Center of the St. Paul Campus. It is aimed at high school teachers, school board members, legislators, and the general public. The purpose is to examine the creation-evolution controversy as it relates to education and science. John A. Moore will give the keynote address. Fourteen lecturers will participate, including two who have written for *Creation/Evolution*. Contact Peter Zetterberg, Department of Conferences, University of Minnesota, 211 Nolte Center, 315 Pillsbury Drive SE, Minneapolis, MN 55455, (612) 373-3486.

University of Montevallo, Montevallo, Alabama: "Scientific Creationism vs. Evolution: Impact on Public Schools." Early 1982. This program is aimed at freshman students, the university community, and the general public. Speakers for both sides of the controversy will be featured. Contact Ted Wilson of the University of Montevallo, (205) 665-2521.

American Association for the Advancement of Science Annual Meeting. January 3–8, 1982, at the Washington Hilton Hotel, Washington, D.C. There will be an all-day seminar on creation and evolution. The morning session, entitled "Science and Belief," is being organized by Rolph Sinclair of the National Science Foundation. The afternoon session, entitled "Problems for Science Education," is being organized by Bob Hanson and will feature Dorothy Nelkin, Wayne Moyer, Frank Awbrey, and representatives from the Committees of Correspondence. Contact Bob Hanson, University of Northern Iowa, (319) 273-2021.

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A Survey of Creationist Field Research

Anthropology
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Henry P. Zuidema

A solution to the question of origins cannot be found in the library stacks. The search goes on in the laboratory and out in the field, in biochemistry, paleontology, geology, and supporting disciplines in science. It was therefore inevitable that the "scientific" creationists would have to make a showing in "original research" to lend substance to their claim that the scientific data support biblical revelation over evolution. A summary of some field projects by the Institute for Creation Research will thus be of interest to those seeking to assess the validity of "creation-science."

The Search for Noah's Ark

Among the early ICR projects were the expeditions, begun in 1971, to Mt. Ararat in search of Noah's ark. Though this age-old quest might seem barely amenable to scientific study, there is a Jacques Cousteau allure of being "on the scene" in scientific endeavors and, moreover, ark searches over the years have received good press.

The leader of these expeditions was John D. Morris, son of ICR director Henry Morris. Young Morris at that time had a B.S. in civil engineering from Virginia Polytechnic Institute, where his father, a hydrologist who has written extensively on flood geology, had earlier been chairman of the civil engineering department. John Morris recently was awarded a Ph.D. in geological engineering at the University of Oklahoma.

From these expeditions came John Morris's *Adventure on Ararat* and *The Ark on Ararat*, two books still featured in the ICR catalog. *Adventure on Ararat* is described in glowing terms in a 1974 handout as, "A fascinating first-hand story of the search for Noah's ark, believed still to be preserved in a frozen lake somewhere on the high slopes of Mt. Ararat. Exciting adventure, danger, miraculous protection." These books record an enterprise that very evidently was poorly financed and manned. A chief backer was a middle-aged Michigan businessman

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Henry Zuidema, a paleontologist, is also a science writer and former editor of Earth Science. *During 1947–1951 he discovered the Ruby Valley (Montana) fossil insect and plant locality.*

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who managed to keep going on the arduous mission to the snow fields at the crest of the 17,000-foot peak. The group of young explorers admittedly had minimal mountaineering experience. The requirements for the volunteers, in fact, had little to do with climbing abilities or scientific background. The criteria specified that participants, financed by families or church groups, should be literate and fluent so as to better relate on their return their experiences to audiences. And they had much to tell.

The group found itself in a restless corner of Turkey, which bordered the Soviet Union and Iran and where Kurdish tribesmen long have been in revolt. Suspicious natives fired on the party. Equipment was looted. Bad weather harassed them. There were rock falls, and, during a storm, three members were knocked down by lightning. There was even a brief dispute about leadership which Morris soon settled, convinced, he wrote, that Satan had entered the camp.

There were "sightings" of the ark in the inhospitable terrain of treacherous gorges, but the ark eluded discovery. Morris, writing from his engineering background (as he points out in his reports), nonetheless concluded that the ark must have had a capacity equal to 567 standard railroad stock cars which could hold 50,000 animals. Drawing on zoological research, he saw no great problem concerning the handling of the varied cargo. In time of peril, he argued, such as during floods and forest fires, animals may undergo personality changes and freely mingle.

Future attempts to achieve success have been under discussion, but a member of the ICR staff has counseled that "the Lord will reveal the Ark at a time of His own choosing."

An Expedition to the Bannock Overthrust

Another challenging task was undertaken by the Institute in its investigation of the Bannock overthrust complex, which extends along adjoining corners of Wyoming, Utah, and Idaho. Mapping of rock outcrops in the area by the U.S. Geological Survey and various universities for over half a century shows widespread faulting along mountain fronts with strata pushed up and over other strata, this causing a doubling-up of the normal rock sequence in comparison to what is in adjacent undisturbed regions. The rocks involved are millions of years in age and more recent strata are found buried beneath overthrusts of much older formations.

This set of conclusions on overthrusts conflicts with the opinions of many creationists, including Profesor Harold Slusher who teaches physics at the University of Texas–El Paso and who is head of the physical sciences department at Christian Heritage College, of which ICR is a division, and Clifford Burdick, who has been the advisor on geology for the Creation Research Society and was a

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consultant for, but nonparticipant on, the ark expeditions. Assigned to the Bannock project, Slusher and Burdick, together with John Morris and Frank Baxter, proposed that the overthrusts and, in fact, the whole geologic column were the misconceptions of faithless stratigraphers in an attempt to support a sequence of evolutionary deposition over vast eras. To some creationists, such as John Morris, there was a destruction of preexisting strata during a worldwide flood, hence a mixing of sediments and their fossils. All this happened just prior to the Ice Age. Therefore, if they could prove that the Bannock overthrust, with attendant implications, did not exist, then evolution would be deprived of a major support, since fossils would lose their significance.

The four researchers were not pioneers in this venture. The same ground had been covered by George McCready Price, a "scientific" creationist of another generation, whose text, *The New Geology*, has a place in history as a classic example of pseudoscience.

The initial step in investigations such as these is to consult the literature of previous projects in order to determine what others have already done. Maps and reports were available that could have led the explorers to key areas, such as Monticello Canyon in Utah. There was no need to accept them as authority, but they did indicate where best to search.

Published reports of the ICR Bannock investigation in the November 1974 *Acts & Facts*, and elsewhere, suggest a hasty reconnaisance of a small part of the overthrusts region in the Wasatch Mountains near Ogden, Utah, and the Heart Mountain area in Cody, Wyoming. The research team reported some evidence of very rapid deposition of strata with an absence of thrusting or sliding. Yet there were inconclusive results, which will necessitate that some factors be rechecked.

Major oil companies, impelled by current energy needs, subsequently invested millions in stockholders' money in the costly venture of deep drilling in order to reach oil and gas which geologic maps suggested could be deeply buried beneath the overthrust. If creationist doubts proved to be valid, would the investments be misspent? Or would geophysics save the oil seekers from metaphysics?

The drillers penetrated ancient sterile strata, which thrust faulting had forced atop more recent petroliferous rocks. They were guided by the recovery of rock fragments and microfossils that have been identified in other oil and gas reservoirs. The result? They struck it rich with the discovery of new fields in both the Rocky Mountain (including the Bannock) and Appalachian thrust belts. The geologic column still stands.

Exploring Along the Paluxy River

If one were to accept the concept of a very young earth only a few thousand years old, would that mean that dinosaurs and humans existed together at the time of

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the deluge? This hypothesis has long fascinated ICR, and exploration to research it was started in 1975 in the Paluxy River area, near Glen Rose, Texas.

Few fossil localities have been explored so diligently over so long a period of time as was the Paluxy site. Tons of dinosaur tracks have been removed for display, such as that at the American Museum of Natural History. Paleontologists insist that there are no "human tracks" among these, but science is nourished by the unknown, and such a find would bring crowds to any museum door.

ICR actively entered the Paluxy scene as a result of interest that had been stimulated by a motion picture made by the Films for Christ Association, an Illinois operation. The film makers, in turn, had been attracted to the area by the writings of Burdick, who had been pursuing for forty years evidence of "giant humans" in North America.

Burdick has announced possession of human tracks, or at least plaster casts of these, and a large cat track, claimed to be that of a sabre-tooth tiger. The latter is mentioned in John Morris's book, *Tracking Those Incredible Dinosaurs . . . and the People Who Knew Them*, as "reported found in the Glen Rose limestone," the rock through which the Paluxy River has cut its channel. While references to the tiger track are vague, Morris points out that, since these cats are thought to have evolved some 50 million years ago and the Glen Rose strata are dated by geologists as being at least 100 million years old, this discovery "is almost as damaging to evolutionary theory" as are the purported human prints. "One well-documented factual observation," he says, quoting another creationist writer, "would rob the theory of the huge time spans regarded as the *conditio sine qua non* for evolution to have occurred."

Therein lies the rub. As of this article, not one impression of a human foot, in stone, has been removed from the Paluxy rocks under the precautions needed in such work so as to be available for scientific study. The ICR museum has impressions, but these are plaster casts, and paleontologists want original material for description and identification. There were some rubber pullings taken by the film makers, but word from the museum is that these have now "deteriorated."

Much of the locality where the tracks were supposedly found is state park land and therefore could not be removed without a permit. This is unfortunate, as Morris indicates. In 1975 he and Professor Edward Blick, a member of the ICR advisory board and also on the engineering faculty of the University of Oklahoma, were taken on a tour by Cecil Dougherty, a Glen Rose chiropractor who has been examining the river bed for many years. Dougherty showed them the "manlike tracks." These, Morris said, "included perhaps the most perfect track ever found. This recently exposed track was in a most vulnerable position and, within a year of its discovery, had completely eroded away."

Morris deplores the fact that other fundamentalists have been critical of the ICR operations in that area. Several universities, including Baylor (which is Baptist), Southern Methodist, and a group of Seventh Day Adventist colleges, have

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examined the dinosaur trackways. "Baylor studies have been the most extensive," he says, "but, of course, the idea of man prints is ridiculed." The Adventist schools, including California's Loma Linda University, studied the tracks (some of which appeared to be prints of moccasins) but felt that the case for human occupancy in the days of the giant reptiles had not been proved.

The subject is further fogged by the many reports of the fabrication of humanlike prints by residents of the Glen Rose area in an attempt to enhance tourist trade during the economic depression of the thirties.

Other Field Research

The April 1975 *Acts & Facts* reported the discovery of a new flood tradition by Les and Kathy Bruce, son-in-law and daughter of Henry Morris and missionary linguists with the Wycliffe Bible Translators. They had been working with the Alamblak tribe, who live along the Karawari and Wagumpmeri Rivers in northern Paupua-New Guinea, and had managed to combine into one tale various versions of a flood story from the four clan groups of the tribe. The conclusion was that, since "all nations are descended from the three sons of Noah," then "it would be expected that, through stories passed down [through generations], many of them would retain distorted memories of the great flood." The ICR people felt that this tribe's ancestors had to have had personal knowledge of the deluge, since the tribe now lives too far from Ararat and Babel "to have obtained the flood story from some other source." They disregard the fact that major floods have occurred throughout history in many parts of the globe and that this could be why "such flood stories have been found in tribes all over the world."

In light of this "original research," it appears that the claims of "scientific" creationism can easily be questioned. In fact, after investigating ICR's several field projects, Professor Donald J. Weinshank of Michigan State University could only conclude that "not one of these came even close to observing the accepted standards of the scientific method."

So, as the Institute for Creation Research pursues its mission to "save the world from Darwinism," it might well consider getting out of field work altogether and concentrating on what it does best—library research and quoting evolutionists out of context. Creation "science" is on safer ground being a species of literary criticism. The natural world is too full of booby traps for the eager believer and ICR has turned up nothing to date that its followers had not believed all along.

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Arkeology: A New Science in Support of Creation?

Robert A. Moore

Among the hodgepodge of claims and assertions that pass for "proofs" of creationism, one of the most popular is the alleged preservation of Noah's Ark in the glaciers of Mt. Ararat in eastern Turkey. If indeed a ship is discovered at that improbable location, so the argument runs, it would be undeniable evidence that the story of the deluge in Genesis is trustworthy, and this, in turn, would mean that the historicity of the remainder of the creation narrative is verified and creationism and flood geology stand confirmed.

As John D. Morris of the Institute for Creation Research writes, "The discovery of Noah's Ark would immediately render the current premises of historical geology totally obsolescent. . . . Such a development would apply the final death blow to the already fragile philosophy of Darwinian evolution" (p. 110). Fellow Mt. Ararat climber Larry D. Ikenberry agrees: "Rediscovery of a 450-foot ocean vessel, two and one-half miles high on a mountain would shed new light on popular concepts of origins! . . . The intellectual basis for the theory of organic evolution would crumble" (p. 67).

As creationism is essentially a popular appeal to those lacking scientific expertise, one can readily appreciate the force of such reasoning, especially when it is backed up by exciting mountaineering adventures and feature-length pseudo-documentary movies. Of course, the famous boat has not yet turned up, but that hasn't dampened the enthusiasm of its proponents, who dutifully list a large number of sightings, photographs, wood fragments, and other items that thoroughly convince them and, hopefully, their audiences.

Older Ark Stories

The argument-from-the-ark in its modern form is quite new—little more than a decade old—but, in other guises, it has been around a long time. In the early centuries of Christianity, the church fathers occasionally resorted to it in their disputes with the pagans. For example, John Chrysostom, the famous patriarch

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Robert Moore, a writer on religious subjects, has testified at hearings on church-state issues and is an experienced mountain climber (with no intention of joining any ark expeditions).

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of Constantinople, in a fourth-century sermon asked, "Do not the mountains of Armenia testify to it, where the ark rested? And are not the remains of the ark preserved there, to this very day, for our admonition?" (Montgomery, p. 78). Bishop Epiphanius of Salamis (315–403A.D.) chided unbelievers, "Do you seriously suppose that we are unable to prove our point, when even to this day the remains of Noah's ark are shown in the country of the Kurds?" (Montgomery, p. 77).

The force of these claims was unfortunately blunted by the fact that there was no certain location for the ancient vessel; each nation or tribe with a flood legend believed in its own landing site, often containing remains preserved "to this day." In addition to Agri Dagi (present-day Mt. Ararat), Lloyd R. Bailey lists nine other mountains connected with the biblical-Koranic tradition, of which each has been touted as the true location of the ark (chapter three). Modern apologists are quick to point out that the Genesis story, unlike many others, does not place the ark on a convenient nearby peak, such as Mt. Hebron, but far off to the north in Armenia—this supposedly lending greater credibility to its version. In reality, this feature shows the eclecticism of the ancient Israelites, who, in their nomadic wanderings and forced exiles, borrowed freely from those with whom they came in contact. In this case the donors were the Hurrians, a people who migrated south from Armenia in the third millennium B.C. and who became an important link in the westward spread of Babylonian ideas (Teeple, pp. 26–7, 33). The Babylonian deluge myth was probably related to the Hebrews through the Hurrians, complete with their geographical modifications.

After the triumph of Christianity, ark preservation stories continued to appear from time to time, but they were no longer used apologetically, since everyone believed the Bible. In an era when hundreds of pieces of the cross, vials of the Virgin Mary's tears, and other such marvels abounded, the distant vestiges of the ark would scarcely excite anyone. It says something for the credulity of modern believers that such tales are dutifully recited and tallied up, as if a dozen unfounded myths add up to one solid fact.

The age of exploration and discovery culled another handful of reports, all being mere descriptions of local legends of the same "is-is-said-by-the-natives" nature. Marco Polo, for example, took note of Mt. Ararat's claim to fame and is quoted with approval by ark searchers. Unmentioned are such facts as that, elsewhere during his travels, Polo saw a mountain that had been moved at the command of a local Christian who had "faith as a grain of mustard seed," thereby converting much of the local Moslem population (White, vol. II, p. 211).

Such was the state of affairs until the present century. An unconfirmed report here, a third-hand newspaper account there, and one or two unreliable eyewitnesses round out the nineteenth and early twentieth centuries. It is little wonder that the early battles between Darwinism and biblical literalism were fought without the benefit of this important information. Most of the orthodox

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authors never mentioned it, and the few who did did not accept it. Our current crop of creationists look back ruefully on this faux pas of their predecessors. Violet M. Cummings, discussing a sighting which was made in 1856 but went inexplicably unreported for ninety-six years, sighs, "If the truth had been disclosed at the time this event took place . . . the religious history of the entire civilized world would have been altered and . . . the conflict between creationism and the evolutionary theory would have been over before it had fairly begun!" (1975b, p. 111).

The Modern Quest

The modern era of ark searching began in the early 1940s when a number of religious papers in America carried a sensational story about a Russian expedition claiming to have discovered the sacred vessel. In brief it was related how, late in World War I, a Russian pilot flying near Mt. Ararat spotted a shiplike object protruding from a glacier. He reported this enigma to his superiors, who relayed it on up the line until the czar dispatched a large party to investigate. After nearly a month of grueling effort, the ark was found and thoroughly explored by up to 150 men, who confirmed that it perfectly matched the description given in Genesis. A report was prepared and sent back to Moscow, but, as luck would have it, it vanished during the Bolshevik Revolution. Some say Leon Trotsky destroyed it. Now, a quarter of a century later, the truth was out.

However, the ink had barely dried before serious questions and criticisms arose, and the fabric of the tale quickly began unraveling. By 1945, *New Eden*, where it initially appeared, and at least two other magazines, had printed retractions, and the author, Floyd M. Gurley, confessed that the story was 95 percent fiction. Subsequent examination of the remaining 5 percent "core of truth" has fairly well eliminated even this much (Noorbergen, pp. 95–96), and, in fact, it now appears that the entire episode originated in The Netherlands in 1933 as an April Fool's joke (Parrot, p. 64). Nevertheless, the one hundred plus members of the phantom expedition are still faithfully added up, yielding over half the total number of persons who have seen the ark in modern times.

Recantations notwithstanding, modern ark fever had begun. In 1949, instructed by a "revelation from God," Reverend Aaron J. Smith of Greensboro, North Carolina, set out on the first expedition specifically organized to locate the ark (Parrot, p. 65). His group thoroughly explored the region under ideal conditions and drew a complete blank. Edwin Greenwald, a reporter who accompanied them, concluded:

> The ark of Noah, if it ever landed on Mount Ararat, is lost eternally to the ages. It will never be found. . . . The four-man expedition . . . explored

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> every crevice and every clue. It scouted through the villages for one hundred miles around, seeking anyone who might know anything. Nothing, absolutely nothing, was uncovered. . . . In the villages, the old men and the young had heard the legend that a great boat once rested in the snow way up there. But no one had ever seen it, and they knew of no one who had. (LaHaye and Morris, p. 123)

Smith returned home dejected but with his faith in the ark's existence unshaken.

The next man to trek to eastern Turkey had better results. French industrialist and amateur archaeologist Fernand Navarra made three trips to Mt. Ararat—in 1952, 1953, and 1955. On the third occasion, he and his son Raphael spotted what appeared to be a shiplike silhouette under the ice, and, climbing down into a deep crevice, he recovered pieces of hand-tooled wood. The two eagerly rushed it back to Europe and had it tested, where it turned out to be approximately five thousand years old—just the right age to have come from Noah's own carpentry shop. Proof at last? It certainly seemed suggestive, and Navarra exulted, "For me [it] is a certitude: I have found the ark of Noah" (Montgomery, p. 138).

However, two lines of inquiry have thrown a cloud over Navarra's achievement. In the first place, several people, including Colonel Sahap Atalay and J. A. deRiquier, two of Navarra's climbing companions, have accused Navarra of deliberate fraud, of planting the wood in the crevice so that it could later be "discovered." He has, of course, denied this, but the circumstances of his find remain suspicious. And when he led another probe to the same part of the mountain in 1969, wood fragments again turned up, but only after he had had an opportunity to be alone on the glacier. Such problems prompted even true believers such as LaHaye and Morris to comment, "There are certain discrepancies in Navarra's account which cast grave shadows over its authenticity" (p. 133).

Second, the dating of the wood has had to be drastically revised. The earlier tests used highly dubious techniques, such as density, color, and degree of lignitization; since then a number of laboratories have tested it by the radiocarbon method, and the dates derived in this manner all focus around the eighth century A.D., over three thousand years too late for the deluge. Bailey has studied the dating question in some detail, and he shows that the ancient age is quite untenable. So, however the wood came to be in the ice, it did not get there from Noah's ark (pp. 64–80).

Ark reports were thus increasing, but still they were being ignored in creationist argumentation. Alfred M. Rehwinkel, in *The Flood in the Light of the Bible, Geology, and Archaeology*, devoted an entire chapter to the story of the Russian discovery, debunking it in a manner of which a modern skeptic could be proud. Even as late as 1961 the standard text of flood geology, *The Genesis Flood* by Whitcomb and Morris, relegated it to a footnote with the comment, "We fear

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that any hope of its preservation for the thousands of years of post-diluvian history is merely wishful thinking" (pp. 87–88). Perhaps one reason for such disbelief is that creationists regard the earth as tectonically peaceful prior to the flood with volcanic activity virtually unknown. As Whitcomb (1973) states:

> Enormously high, snow-capped mountain peaks could not have existed before the flood. "The world that perished" had low-lying mountains, which were probably less than six- or seven-thousand-feet high. . . . Scripture tells us that it was not until *after* the flood that "the mountains rose" (Psalms 104:8). Their rise to great heights was both sudden and supernatural (p. 40).

Since Agri Dagi is a tremendous, 16,946-foot volcano, it presumably would have been erupting into existence during and shortly after the deluge, forming a severely inhospitable place for Noah and the animals to disembark.

But the pendulum was now swinging hard in the opposite direction. The late 1960s and early 1970s saw the remains of the ark emerge as a major anti-evolutionary weapon. The explosion of creationist activity at this time, the trend away from science and toward the occult by the nation's youth, the involvement of the Institute for Creation Research in expeditions in Turkey, and the sophomoric simplicity of the ark as evidence all played a role. Numerous articles and at least ten books rapidly appeared, all pressing the claims of the ark seekers. Lecturers traveled around the country preaching the news; while other groups, ranging from ill-prepared amateurs to well-financed expeditions to illegally trespassing explorers, tromped about Armenia and up and down Mt. Ararat. In 1974, the Turkish government eventually had to close the area, which borders the Soviet Union, to foreigners.

Pundits nicknamed the searchers "arkeologists" and the name stuck, giving us a new pseudoscience alongside UFOlogy, pyramidology, and the like. Now, in addition to biology, geology, and cosmology, creationists could boast that their scientific enterprise included archaeology as well. *Reader's Digest* and *Newsweek* carried stories about the sightings, and publications that should have known better, such as *Sea Frontiers* (Gaunt) and the *Standard Encyclopedia of the World's Mountains* (Huxley), offered uncritical reports and comments.

The climax was reached in 1976, when, after a couple of minor ark films had appeared, Sun Classics Pictures released *The Search for Noah's Ark*. This well-made movie, in documentary fashion, gave supposed archaeological proof that the Bible is factual, presented the "scientific" case for flood geology, and surveyed the attempts to find the ark on Mt. Ararat, concluding that the story of Noah is "impeccably true." It was a surprising box-office success and was subsequently shown twice on NBC-TV in 1977. Noah's ark had finally come into its own.

Today, although emphasis on it has diminished a little with no new forays into Turkey, ark theory still remains a substantial piece of ammunition in the

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creationists' arsenal. As recently as February 1981, a new fifty-five minute movie, *Noah's Ark and the Genesis Flood*, was released for distribution to churches, conventions, and similar places.

The Science of Ark Searching

Having briefly traced the history of ark hunting from its origins in pious Armenian mythology to its prominent place in modern creationism, it might be instructive to take a look at the techniques employed in gathering evidence of the ark's preservation in contrast to those employed in the practice of less exotic sciences. How does one "do" arkeology? I shall not examine each alleged sighting one by one, which has been adequately done elsewhere (Bailey, 1978; Stiebing, 1976; Teeple, 1978), but shall concentrate on the methodology used.

We have already noticed the process of reciting ancient legends as if they were officially documented reports; this same tactic applies to the more recent sightings, no matter how unsubstantiated. For example, in 1948 news filtered out that a Kurdish peasant named Resit had chanced upon the vessel. Subsequent efforts to confirm this report, even with the incentive of a monetary reward, not only failed to even *find* anyone named Resit or anyone who knew him but also turned up a complete denial among the local populace near Mt. Ararat of any knowledge whatsoever of the ark's remains. Mr. Resit is nevertheless favorably mentioned in ark literature.

Besides missing witnesses, there is a special class of references: missing documents. In addition to the ill-fated report to the czar, there is a whole battery of lost newspaper articles, magazine accounts, and vanished photographs—all of which, if they existed, would offer powerful evidence for the ark. As it is, since there is always someone somewhere who recalls having seen the item in question, they offer to arkeologists powerful evidence for the ark and are cited accordingly. The most famous missing photos were taken from a helicopter in 1953 by George J. Greene, an employee of an American oil company. A number of people claim to have seen them before he was murdered in 1962, at which time they disappeared. At that time they were not convincing enough to persuade anyone to join Greene in an ark-searching expedition; only now, when they are gone, do the photographs serve to "verify" the ark's presence on the mountain. Gaskill suggests that in this wild, rugged, mountain area they were really pictures of a large rock formation.

Another type of unavailable resource that is popular with most fringe sciences is the "government secret." In addition to a collection of wrecked flying saucers and Bermuda Triangle cover-ups, Uncle Sam supposedly has satellite and reconaissance photographs of the Mt. Ararat region that clearly show the ark. In a section entitled "The Undisputed Facts," Balsiger and Sellier state, "Early in

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the decade of the seventies, American spy planes [and] weather and military satellites photographed the structure on Mt. Ararat" (p. 2). Needless to say, the Freedom of Information Act is being diligently pursued in order to obtain these treasures. In this case though we not only have Washington holding back, but Moscow as well, for the Soviets too have decisive documentation, but, being atheists, they are not about to release it. "Little doubt remains," writes LaHaye and Morris, "of Russian knowledge on the subject and their continued suppression of the evidence," since, of course, "godless communism relies on evolution" (pp. 108, 112).

A few photographs do exist, and they are nearly always dramatically displayed. One is openly admitted to be a fake; another, which appeared in *Life* in 1960, was found by a hastily dispatched party to be an unusual rock formation. A blurred slide, taken from the air in 1966 and showing a "mysterious object" in a remote chasm, has been the subject of much excited speculation, including, since this site is different from others, the theory that the ark is broken into two or more pieces in various locations. Montgomery tells us that "the analysis of the slide makes it plain that whatever the object is in the lower left-hand corner, it is foreign to the material of the mountain" (Balsiger and Sellier, p. 164), but Cummings reveals, "The summer of 1973 saw this controversial object positively identified once and for all. . . . [It is] an immense basaltic rock formation covered with a white leach material resembling, from a distance, a blanket of snow!" (1975a). But it unfortunately was not quite "once and for all," for at least four books written since 1973 have continued suggesting that we may have a photo of the reclusive ship at last. There is a satellite photograph that shows absolutely nothing but a view of Armenia from 450 miles up. Yet no ark book or movie would be complete without its inclusion!

Of some concern to arkeologists is the fact that there are other mountains with arks on them, and these heretical versions must be disposed of. Misquotings, ommissions, and ingenious interpretations usually turn the trick (see Bailey, pp. 22-45). The location given in the Koran—Jabal Judi, a peak in Arabia—is probably the toughest of which to dispose, since faithful Moslems have reported seeing the ark there as recently as 1949 (Parrot, p. 65). Cummings (1975b) makes a strained attempt to identify Jabal Judi with Agri Dagi, while Kelly Seagraves goes so far as to pinpoint "Al Judi" to a small, heart-shaped snowfield on the northeast slope of Greater Ararat—the precise spot where many arkeologists believe Noah landed. They happily conclude, therefore, that "the Bible and the Koran refer to the same mountain" (Seagraves, p. 15).

In cataloguing the data, a flat-out denial of discovery can be as important as a well-publicized sighting. In 1933 Carveth Wells, a Los Angeles radio commentator, traveled to the Middle East and Russia looking for the ark. The title of his book, *Kapoot*, summarizes the success he enjoyed. In it he specifically denied even entering Turkey, but arkeologists suspect that he secretly crossed the Soviet

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border, climbed Mt. Ararat alone, found the ark, and smuggled out a piece of wood. And thus another witness joins the list.

Or take Russian explorer E. de Markoff who climbed the peak in 1888. On the way up he discovered a piece of wood and burned it to boil water for some tea. Twelve years earlier James Bryce of Great Britain had also found wood and, being a good Christian, claimed that it was from the ark, although he admitted that it could have been a remnant from a monument erected by previous climbers. In Markoff's case he never once doubted that it *was* such a remnant, especially since his stick had Russian initials carved on it, a language presumably unknown to Noah but well known to Colonel J. Khodzko who had reached the summit in 1850 and had erected a monument. Montgomergy nevertheless devotes a chapter entitled "More Tantalizing Wood" to Markoff, suggesting that, in spite of everything, the fragment was a genuine relic from the sacred ship.

Since World War II, nearly forty expeditions have journeyed to the Near East with the specific purpose of finding the ark; but, except for Navarra's dubious wood samples, they have been uniformly unsuccessful. Even though the Holy Spirit revealed the ark's exact location to one seeker in a dream (Teeple, p. 103) and led another to believe that on the morrow he would see it (Morris, p. 55), apparently neither could find it. Teeple summarizes:

> Great Ararat has been explored on all sides by ark enthusiasts and must have been explored considerably also by military units. An impressive number of ascents have been made. . . . In the twentieth century, large sums of money have been spent in organized expeditions to find remains of the ark. . . . Surely the mountain has been searched quite extensively by now! (p. 111).

Yet, creationists won't take "no" for an answer; these multiple failures seem only to strengthen their belief that success is just around the corner, if only the uncooperative Turks would let them back in.

Finally, and perhaps most amazingly, one can invent sightings out of whole cloth. In the most recent pro-ark book, Meyer lists a Turkish expedition in 1840 that spotted the ship (p. 80). I can find no other reference to this event anywhere, and Meyer supplies no documentation whatsoever. The only explanation I can think of is that when in 1883 a major earthquake shook the area, a government team, sent to inspect the damage, reported alledgedly having seen the ark. Since another even larger earthquake occurred in 1840—one which ark enthusiasts believe exposed the vessel, thus inaugurating the modern era of sightings—perhaps the two dates were confused. In any event, it became a "discovery" in its own right, and no doubt in future ark literature this "nonevent" will acquire added details and become a full-fledged incident, thus proving the reliability of the Bible.

Such, then, is the method and madness of creationist arkeology. It is not, in any meaning of the term, *science*. Starting with the results known in advance, the

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object is merely to confirm them. Anything contrary is ignored, unless it can be explained away; everything favorable, no matter how devoid of value, is eagerly seized. And, unlike its traditional cousin which begins with an existing artifact and studies it, arkeology has no specimen at all but nevertheless can describe it in intimate detail, including its internal construction, its purpose and date, and its implications, and, with characteristic arrogance, challenges any doubters to give up their hard-headedness. These sorts of tactics could be (and often are) employed with equal success in the quests to discover Atlantis, the Seven Cities of Cibola, or the entrance to the hollow earth. They are typical of that type of people described by Jean-Paul Sartre who, "since they are afraid of reasoning . . . want to adopt a mode of life in which reasoning and research play but a subordinate role, in which one never seeks but that which one has already found" (quoted in Kaufmann, p. 135).

Is there, then, nothing at all on Mt. Ararat? Many bona fide researchers, feeling that with so much smoke there must be some sort of fire, have proposed the theory that medieval monks built a shrine high on the mountain to commemorate the legendary landing of Noah. Dr. A. Dupont-Sommer suggested such a solution as early as 1951 (Parrot, p. 66), and there is some evidence that may point in this direction (Bailey, p. 94). After all, in an era when relics and shrines abounded and piety was proportional to the inhospitality of one's retreat, a sacred site on the ice of Mt. Ararat is not inconceivable. Even so, I believe that the data is so scanty that even this modest solution is unnecessary. When one considers the cases of pious fraud, the utter failure to recover one piece of evidence that can withstand scrutiny, the presence of unusual rock formations in this craggy, volcanic region, and American fundamentalists' unlimited will to believe, it is quite possible that there is nothing whatsoever humanmade on the mountain except a few tattered remains from early climbers' monuments. But, whichever view one takes, it can be stated with assurance that there is not now, nor has there ever been a huge ship equipped with cages and stalls for animals and piloted by a man named Noah on the summit of Mt. Ararat or Jabal Judi or any other peak, and the creationist use of this as a definitive refutation of evolution and historical geology merely shows the weakness of their overall case.

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Paluxy Man—
The Creationist Piltdown

Christopher Gregory Weber

Creationists, by citing examples of fossils that are supposed to be in the wrong order for evolution, often try to prove that the geological time scale is in error. In particular, they claim that human footprints have been found in rocks containing traces of dinosaurs and other animals that died out millions of years before humans actually appeared on the earth. As we shall see, however, these alleged footprints are either natural objects that have nothing to do with humans or are deliberate frauds. On the whole, the leading creationist authors are intelligent and sincere, but it seems that they have a very strong will to believe when it comes to defending their model.

Ingalls's Paleozoic Footprints

One example of this occurs in *Genesis Flood*, in which the authors, Whitcomb and Morris, quote Alfred Ingalls in an attempt to prove that human footprints have been found in some American Paleozoic rocks—200 million years too early to fit into evolutionary chronology. Ingalls, however, doubted the authenticity of these footprints. For this, Whitcomb and Morris accused him of intellecutal dishonesty:

> Ingalls and others have tried to explain the prints as modern Indian carvings or as prints made of some as yet undiscovered Carboniferous amphibian. Such explanations illustrate the methods by which uniformitarians can negate even the most plain and powerful evidence in opposition to their philosophy. Nevertheless, it is obvious that it is only the philosophy and not the objective scientific evidence that would prevent one from accepting these prints as of true human origin (p. 173).

The only problem is that the footprints in Ingalls's photographs are highly stylized petroglyphs that even an untrained observer could scarcely mistake for real human footprints. Therefore I don't think anyone is being intellectually dis-

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honest for suspecting that Ingalls's footprints were made with human hands instead of human feet.

The Paluxy River Tracks

According to many creationists, human footprints and dinosaur footprints are found side by side in the Cretaceous limestone of the Paluxy River near Glen Rose, Texas. This is the "find" most frequently stressed in creationist literature, so it will be useful to cover it in some detail.

To correctly analyze these tracks, it is first necessary to understand a few facts about the Paluxy River site. Most of the dinosaur prints that have been found there are genuine. Many show clear, large ridges of mud squished up all around the footprint. Scientists confirm that during Cretaceous times the withdrawing sea left a swampy area in which dinosaurs left tracks in the sediment. Under the sun, these tracks were baked solid in the mud. Flooding rivers later buried the tracks under more sediments.

The Paluxy River today is a fast-flowing river which sometimes dries up totally and at other times floods strongly enough to carry downstream four-ton slabs of limestone. When the river dries up, prehistoric dinosaur tracks can become exposed to view, such as those Roland T. Bird excavated and removed to the American Museum of Natural History in the 1930s. In times of flooding, the river dumps limestone slabs and debris on top of previously exposed prints. According to Beierle (1977), this is why John Green and Dr. Jack Walper had to reexcavate some "human footprints" in 1976, which had been excavated only a few years earlier for the creationist film, *Footprints in Stone.*

Among the prints that have been removed from this site are half a dozen detailed humanlike footprints and two large "saber-tooth cat tracks." These are frequently mentioned in creationist works. However, upon later examination, they have all turned out to be probable or actual hoaxes. Flood geologist Clifford Burdick has described these prints, and Beierle (1974, 1977) and Whitcomb and Morris show pictures of them in order to prove that humans and dinosaurs lived together at the same time. Burdick owns one "man track" and one "cat track"; the rest have been sent to the museum of Columbia Union College in Takoma Park, Maryland. Burdick's prints could easily have been carved, and those at Columbia Union College definitely were.

Burdick's prints have been cross-sectioned, and the results are ambiguous. John D. Morris claims that these cross sections prove that the prints are genuine. He reasons that, if the tracks were carvings, they would be scooped out and would slice across horizontal strata. He claims that the cross sections show that the laminations of the rock follow the contours of the print. However, Seventh-day Adventist geologist Berney Neufeld offers a different version:

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> Clifford Burdick, a consulting geologist from Tucson, Arizona, has a man-like track and a catlike track. Both have been sectioned and the evidence is equivocal. Some cross sections have a slight indication of carving; others of conformation. The difficulty with these tracks is that they are in blocks of limestone whose pattern is more mottled than layered.

Neufeld demonstrates by documentation that the Columbia Union College prints are nothing but clever carvings:

> Dr. Don Jones of Columbia Union College, Takoma Park, Maryland, has a number of tracks whose origin is reported as the Paluxy River. The collection includes a right and left human footprint, a pair of three-toed dinosaur tracks, and a large cat print. . . . All of these, in separate blocks, appear to be in the same type of limestone. They also have a single human track of inferior quality that is in a limestone of a different color and texture from that of the other prints. . . . One of the three-toed dinosaur tracks and both types of man prints have been cross-sectioned. In each instance the rock layers end abruptly at the edge of the track, indicating that they are not the result of a foot stepping into soft mud but are produced by carving.

Both Morris and Neufeld admit that these prints were carved during the Great Depression. Neufeld says:

> Local old-timers in the Paluxy River area tell that the tracks were both excavated and carved as a source of income during the Depression years. Both of these collections [the Burdick prints and the Columbia Union College prints] may well be carvings of that period.

And John D. Morris says:

> Accusations have arisen from still another front. Skeptics have claimed that the prints are carvings, not real prints at all. Unfortunately, this charge has some basis; in fact, several enterprising Texans from Glen Rose did make their living during the Great Depression by digging out the best tracks and selling them. The going price ranged from ten dollars to twenty-five dollars, and the dinosaur tracks were much more in demand than the man tracks. Soon, however, the best tracks were gone, and a few men began to carve new tracks (especially dinosaur tracks) out of any limestone block available. As near as researchers can determine, however, only a very few "man tracks" were carved—probably less than six, certainly less than ten. These were all giant tracks, ranging from sixteen to twenty inches in length, and showed all features of the foot. These counterfeit tracks do not, of course, disprove the genuine tracks. In fact, it could only have been the existence of genuine tracks that made the manufacture of counterfeits profitable.

However, John D. Morris's "genuine" prints are not very impressive. Two series of elongated tracks are often considered to be human, but Neufeld points out that some of the tracks in these series are the eroded remnants of three-toed

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dinosaur prints; since the dinosaur placed most of its weight on its middle toe, the side toes of the tracks are a little shallower and erode away more easily, yet some of the tracks in these series retain traces of the side toes. The rest are simply erosional marks in eroded undulating rock, most of which do not appear, in any photos, to have anything around them that resembles squish marks. John D. Morris inadvertently admits that the tracks are not impressive:

> A number of individuals have gone to Glen Rose to see whether there are any human tracks there, and have been unable to find them, reporting then to outsiders that the whole story is fallacious. The problem was simply that they did not know where to look. Many, of course, were skeptical and tended to jump to conclusions too quickly. The fact is, however, that there really are many tracks there which, to all appearances, were made by real human beings who lived at the same time as the dinosaurs.

Beierle (1974) admits that tracks often cannot be seen unless they are wetted: "These individuals were pointing to a series of tracks; but, without wetting-out, the tracks are difficult to see and [are] usually passed over by the untrained observer."

But even *trained* observers, such as paleontologists, have been unable to detect the presence of human footprints, even when standing right over those impressions in question. Neufeld explains why this is understandable:

> Often, in order to contrast the tracks with the surrounding rocks for photographic purposes, they [the tracks] have been painted with oil. The tracks appear to have soaked up some of the oil and now contrast with the matrix even without treatment. In my opinion, these footprints are not tracks at all but represent random erosion marks in the surface of the limestone plate. The surrounding surface is covered with erosional marks of almost every imaginable shape. Individuals have reported visualizing the tracks of practically any mammal species on this surface. . . . It is only with a great deal of imagination that a bipedal trackway can be seen at all.

Therefore, when the carved tracks and eroded dinosaur prints have been accounted for, no one would ever suspect that any other "human" tracks existed unless some creationist painted the "toe" and "heel" with oil or water and called it a "human footprint."

Regardless of proof to the contrary, creationists still accept the "man prints" as evidence. However, once they do accept them, they still have to find a way to fit them into their flood geology model. This isn't as easy as it seems. The flood geologist actually has more trouble explaining how these "footprints" formed than does the orthodox geologist. Are we to imagine that a tidal wave from Noah's flood dumped over two thousand meters of sediment in the Paluxy River valley, that people and dinosaurs ran around making tracks, and that

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another tidal wave miraculously covered the tracks without obliterating them in the process? John D. Morris vaguely admits the difficulty:

> The main problem of geologic origin for biblical catastrophists stems from the fact that underlying the Paluxy River basin is nearly eighty-five hundred feet of sedimentary rock. According to the catastrophic model, this must all have been laid down by the flood of Noah's day. The problem is how could man and dinosaurs witness such massive deposition at the beginning stages of the flood and survive long enough to leave their prints so high up in the geologic column?

Morris admits that the rocks are marine and not postdiluvian. He speculates that the dinosaurs and humans survived on the Llano Uplift, located twenty-five miles from Glen Rose; this sediment-free precambrian rock structure was supposedly above water during the earlier stages of the flood. However, a tidal wave strong enough to carry so much muck in suspension would surely have splashed over the Llano Uplift.

Despite all these contradictions, however, John Morris still insists that "so much evidence has come from Glen Rose, indicating a vast discrepancy in the geologic timetable, that those who disagree with the conclusions must fit into one of two categories: [those who] have not sufficiently studied the evidence or [those who] have not studied it with an open mind."

The only problem with this claim is that, even though the Seventh-day Adventists have a vested interest in proving creationism to be valid, they have rejected the Paluxy River data. And other fundamentalist and creationist colleges have seconded the verdict that the "human prints" are either human carvings or nonhuman impressions.

Typical Frauds

The idea of frauds and errors is nothing new in paleontology. The Piltdown and Calavaras hoaxes are particularly famous examples from the past. It would therefore not be surprising to find that the alleged human footprints of the creationists were frauds or errors as well.

In the case of the Piltdown hoax, someone filed down and artificially filled some of the teeth, broke off the rest, and then broke off the articulation of a modern immature orangutan jaw. They then stained it brown and placed it, along with pieces of a fossilized fifty-thousand-year-old skull of modern man, where it could be discovered. This was in Piltdown, England. When the "find" was first discovered, many scientists accepted it as genuine. This was an easy mistake to make, given that the jaw of an immature ape has a *fairly* humanlike structure. Furthermore, the teeth looked as though they had the wear pattern of

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humans instead of apes and the artifical filling of the teeth looked like the "secondary dentine" that forms in human teeth as they wear down. When some evolutionists finally discovered that the jawbone was really a doctored ape jaw, many scientists were shocked. Since then, however, the discovery of genuine hominid fossils has allowed science to work out human evolutionary history without the nonexistent "Piltdown man."

Now let us consider the Calavaras hoax. In tertiary times, the Stanislaus River of California flowed from the Sierra Nevadas through a different course than it does today; it went through a hilly terrain with tropical forests. One day, an erupting volcano sent a lava flow down into the river, which continued down the sinuous river valley a certain distance before cooling and hardening. The hills in time eroded away, leaving the lava as an elevated area known today as Table Mountain.

During the gold rush, gold was found in the prehistoric river bed under Table Mountain. As a result, many mines were carved there. In one tunnel, a skull, some arrowheads, and other stone tools were found in 1866. The skull was called "Calaveras man" after the county in which it was found.

Cole and Cole say that the owner of the mine called in some scholars to investigate. The investigation revealed that, whereas the other bones in the sand were clearly water-worn, the skull and the arrowheads showed no such signs. The skull also had clay under the cheekbones, yet nowhere else in the gravely environment was there any clay. Modern snails were found embedded in the clay. It was considered unlikely that the prehistoric river would have washed all those bones into a single spot such as what was found. To top it off, the skull and artifacts were found to be exactly like those of modern California Indians. MacDougall adds that John C. Scribner, a local shopkeeper, planted the skull. After he died, his sister and pastor told how he had confessed his fraud to them.

In light of this data, it is strange that standard creationist texts, such as *Scientific Creationism* (Henry Morris, p. 177), *Handy Dandy Evolution Refuter* (Robert Kofahl, pp. 78–79), and *The Creation Explanation* (Kofahl and Segraves, pp. 120–125), still take Calavaras man seriously. They try to argue that this modern human skull was found in prehistoric tertiary strata, thus upsetting the evolutionary chronology. On the other hand, these same authors never let evolutionists forget the Piltdown hoax. Knowing about this double standard, we should not be too surprised if some creationists continue to believe in Paluxy man despite the weakness of their evidence.

Of course, some creationists act persecuted if one suggests that their Paluxy tracks may be fraudulent. But this seems to be part of a double standard too, since creationists in general are not very kind to their opponents. Creationists such as R. Daniel Shaw, author of "Fossil Man: Ancestor or Descendant of Adam?" in *Speak to the Earth*, and Robert E. Kofahl insist that Eugene Dubois suppressed some modern skulls that he found with his Java man skull because he

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realized that these other fossils disproved his theory. The two modern skulls were actually found at Wadjak—eighty kilometers from Trinil, where he found the Java man skull. Shaw and Kofahl also insist that Peking man is a hoax and that the scientists at Choukoutien contrived to have the Peking man fossils lost at the beginning of World War II to keep their fraudulent photographs and plaster casts from being exposed. However, the Peking and Java skulls are certainly not the only evidence for *Homo erectus*; Richard Leakey has found an excellent specimen of *Homo erectus* at Lake Turkana in Kenya, and numerous other specimens have been found throughout the old world. But in light of this creationist attack, I don't think it is unfair to apply careful scientific analysis and criticism to the creationist footprint finds and then reasonably conclude that Paluxy man is indeed the creationist Piltdown.

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An Analysis of the Creationist Film, *Footprints in Stone*

Laurie R. Godfrey

"Excellent film—very stimulating," wrote one secondary school teacher from Converse, Texas. "Great. It is the best film that we have ever used in our science department," wrote another, from Adamsville, Tennessee. "The students were impressed with the findings and thoroughness of the research," wrote one from Youngstown, Ohio. "The film contains scientific information which should be made available to every high school student," wrote a Pelham, New Hampshire, teacher. "Very informative. Appreciated the fact that [the] film left open the subject for discussion instead of presenting only one side. Thank you for your efforts in enriching the curriculum by offering this film," wrote a teacher from Alexandria, Louisiana, one of the most enthusiastic educators.

These quotes are taken from the advertisement provided by Eden Films (Films for Christ Association, North Eden Road, Elmwood, Illinois) for their decade-old film on the Paluxy River tracks, *Footprints in Stone.* When a critic of the Paluxy River tracks asks for evidence, he or she is usually referred to this movie. The film rental is thirty dollars, but you can order it free of charge for showing in public secondary schools if your request is written on offical school stationery.

The praises it has received are not all that surprising. In fact, *Footprints in Stone* is a seductive film, and even sophisticated anatomists may be temporarily fooled by it. The film makers are certainly confident that it will be positively received. In another brochure they boast:

> Bulldozing, sandbagging, flash floods, and the colorful narrative of local old timers all add to the excitement and interest of this fast-moving documentary which shatters the widely taught geologic table of evolution.
>
> This film is meant to reach a vast number of people who have been misled into accepting the evolutionary theory and thereby have come to doubt the forthright statements of the World of God concerning man's origin, salvation, and eternal destiny.

Early this year I rented a copy of the film and showed it at a special colloquium to an audience of approximately one hundred persons, including college

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undergraduates, graduate students, and several faculty (geologists, biologists, and anthropologists) at the University of Massachusetts at Amherst. It became quickly apparent that no one was impressed. One physical anthropologist left halfway through the film; he later remarked that he found the movie to be terribly uninteresting and unconvincing. "If that's the best those creationists can do," he grumbled, "we needn't worry about their proselytizing efforts at all." Several of the students could not contain themselves from laughing derisively at the movie. One commented, "Why, even the filming techniques were amateurish." There was even a creationist in the audience who was left with the same doubtful opinion of the Paluxy "human" footprints. She even advised creationist Al Beeber to remove from the lecture-slide show on "scientific creationism," which he presented to our campus a month later, the slides on the Paluxy River "dino-men" on the grounds that the evidence was "no good."

I must admit that I was a bit surprised at the negative response the film drew. I had excluded my own classes, so as to avoid the possibility of the audience being previously "brainwashed" by my opinions. The showing of the film was publicly announced and opened to students outside the anthropology department. Local creationists were welcomed. Given this situation and given the enthusiastic response that the film had received elsewhere, one might have expected a different reaction.

Why, then, the dramatically negative response to *Footprints in Stone?*

Perhaps it was the fact that every time the film showed an alleged human footprint I stopped its motion, thus allowing the audience to examine the "man print." The "man prints" had been darkened, with either shellac or oil, making them look far more humanlike than they would have otherwise. Indeed, the "man prints" all but disappeared when we viewed the stopped close-ups, ignoring the superimposed outlines. In some cases we could see that the "man print" was only a portion of a larger impression, probably a print made by a dinosaur. In other cases the shellac seemed to connect erosional depressions. We could further imagine how easy it might be to find impressions on such a rough surface which could be painted in such a way as to reveal the outline of a "human" foot.

Such artistry became all the more obvious when the film makers showed the casts they had made of their "man prints." The plaster casts very clearly showed the outlines produced by the shellac; the toes were clearly demarcated and their outlines engraved. But these casts looked considerably more human than the original rock impressions from which they were drawn. One ingenious device used by creationists in this film was having barefoot children and adults place their feet on top of the plaster "replicas" and then move their feet back an inch to show the conformity between their toes and the "toes" darkened and outlined on the plaster casts. (One of my students later wrote to Eden Films to ask whether or not duplicates of their casts could be purchased for firsthand examination. The answer was "no, not yet." *Why* not *yet?*)

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The film does make a valid point: tracks, especially those made on soft substrates washed intermittently with water, may be quite variable in shape. The narrator, Reverend Stanley Taylor, points this out in order to explain the odd shapes assumed by his "man prints." He fails to note that the same is true of dinosaur footprints.

Walter Coombs, a vertebrate paleontologist who has studied dinosaur tracks from various localities, published a marvelous article on this subject in the March 1980 issue of *Science.* In it he shows that tridactyl (three-toed) dinosaurs made very different impressions, depending upon how deeply they sank into the muddy substrate and upon their mode of locomotion—whether walking over the ground or swimming over it, barely touching bottom.

Dr. Coombs, of Amherst College, and Dr. Neil Gomberg, a Brandeis University physical anthropologist with expertise on the anatomy of the primate foot, previewed the *Footprints in Stone* with me just prior to the colloquium. We saw no genuine human tracks (except those made by modern demonstrators). Coombs was able to confirm, however, that some of the "man prints" were genuinely organic (that is, nonerosional). These were, however, universally poor in detail. It is quite possible that, because wet mud had apparently washed back into portions of the original footprint upon withdrawal of the foot thus obscuring much of the detail, that we might never be able to tell *which* animal made them (though it is definite that *some* animal did). The film does not provide the necessary detail to study the matter further; the picture resolution is too poor.

It is fortunate that some Texas paleontologists have examined firsthand the Glen Rose tracks. Wann Langston, Jr., pointed out that some of the "man prints" have distinct claw marks emanating from what the creationists call their "heels." (The creationists apparently reversed the direction of travel for these critters.) Langston also noted that one of the most widely reproduced footprint photos of Paluxy man shows a portion of a poor print of a tridactyl dinosaur; this may be clear, however, only to someone who, having studied the anatomy of the dinosaur foot, knows what to look for. Milne makes the same point using photographs of *in situ* "man prints" taken directly from creationist literature. These "man prints" are nothing more than dinosaur toe impressions, selectively highlighted, with sand obscuring places where the rest of the dinosaur's foot might show. Milne also quotes Langston on the subject: "Langston mentions that the 'human' footprints of this formation often have the 'instep' along the outside edge of the foot, mentions a means by which a large clawed foot, withdrawn from mud, can leave a humanlike track, [and] mentions that some of the 'human' footprints show a large rear claw" (p. 241).

The existence of claw marks on some of the best series of "giant man prints" is now acknowledged by creationist John D. Morris, son of Henry Morris and author of *Tracking Those Incredible Dinosaurs and the People Who Knew Them.* This includes the McFall track, which is shown in *Footprints in Stone.* Since the

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film is advertised as a scientific documentary, shouldn't such an admission accompany the film upon its dissemination to public school teachers? One cannot see the claw marks in the film, because the McFall track is only shown at a distance.

Even without good resolution, it is possible to tell that the "man prints" in the film are not genuine human footprints. Most noticable is the fact that the stride-length/foot-length relationships are wrong for humans, especially for the "children's tracks." When the film makers pointed out "man tracks," they consistently took two or three, sometimes even *four*, steps between supposed right-left impressions. Conspicuously lacking was any discussion of stride, other than the assertion that the giant humans of the bibilical past must have had long ones. But large distances separated supposed "normal human" footprints as well as "giant" (sixteen- to eighteen-inch) impressions. Perhaps their makers did not walk in a manner characteristic of modern humans!

The film features testimonials from Glen Rose old-timers, whose sincerity cannot be questioned. They had seen what they *thought* were human footprints; indeed, some were still selling tours of their "man prints" to tourists. But their descriptions of the size and stride of their best prints (now, alas, completely eroded) suggest that they had mistaken poor toe impressions of tridactyl dinosaurs for impressions of giant men. The fact that the "man prints" with clear claw marks are among those mistaken by these same people for "giant man prints" should discourage one from undue dependence upon the accuracy of their interpretations. Yet, they remain confident. One such old-timer, Jim Ryals, described his experience many years ago "diggin' up the left-hand foot" of a giant man print. "Shape of my own foot," he said. "It had good toes and it had a big toe." Ryals also knew of the carved "man prints" that had been sold to tourists, but this wasn't discussed in the film.

The story of the carved footprints begins during the Depression when the people of Glen Rose excavated dinosaur footprints from the Cretaceous beds in their backyards and fabricated additional specimens, some "manlike," to sell to tourists. Some of these were purchased by Jack Hill, who sold them in his two Indian curio shops, one in Lupten and the other in Gallup, New Mexico. It was a pair of giant manlike footprints exhibited in the window of Hill's Gallup shop that caught the eye of paleontologist Roland T. Bird. The end of an unrewarding fossil hunting season was nearing, and Bird was desperate for fresh prospects.

Upon first-hand examination of the prints, Bird recognized them as phonies and immediately told the store clerk, "I'm afraid your Jack Hill has found himself a pair of fake footprints." It was then that he learned of dinosaur footprints for sale in Jack Hill's other store in Lupten. Desperate as he was for leads, Bird drove to Lupten, only to be disappointed by more apparent fakes. But Bird was intrigued that these dinosaur footprints displayed minutely accurate anatomical details. While it was easy to imagine a stone artisan carving the likeness of a

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human footprint, it was difficult to imagine such a person replicating a dinosaur footprint without some genuine model to copy.

Bird followed his hunch with further inquiries. He learned that the footprints were purchased in Glen Rose, Texas. Geological maps of the region rendered plausible the possibility of finding some actual specimens. So Roland T. Bird was off to the Paluxy River beds of Glen Rose.

As it turned out, it was a lucky lead. Bird closed his 1939 article in *Natural History* by thanking the unknown stone artisan for inadvertantly leading him (and, in subsequent years, many thousands of visitors to New York's American Museum of Natural History) to genuine dinosaur footprints. Two "mysteries" remained unsolved: the identity of the stone artisan and the question of what had provoked the production of fake man prints. The local folk did, after all, talk about uncarved "man prints" in the area. Were they natural erosional depressions? Were they remnants of tracks made by some type of dinosaur? Was there a genuine reptile or amphibian with feet roughly similar in shape to those of humans? Bird never answered such questions (see footnote page 29). When he asked to see a "man print," he was shown only one rough fifteen-inch impression which was totally devoid of anatomical detail. From that he felt he could say nothing. In all his subsequent years of excavating and exploring this region (delightfully recorded in the pages of *Natural History* magazine in 1939, 1941, 1944, and 1945), he never reported seeing another. The matter of the "man tracks" and the stone artisans of the 1930s seemed destined to fade into history.

But Bird's first article on Glen Rose (1939) had caught the attention of a group of special creationists, including Clifford L. Burdick, a mining consultant who later became a central figure in the Creation Research Society and the Institute for Creation Research. Burdick tracked down the very fakes that Bird had exposed. But Burdick, who was no anatomist, was convinced they were genuine. Indeed, it was Burdick who began the assault on Bird which is so often repeated in creationist texts (most notably in those by Whitcomb and Morris, Wilder-Smith, Moore and Slusher, and Henry Morris).

Burdick first published his assault in an article entitled "When GIANTS Roamed the Earth" in the Seventh-day Adventists' *Signs of the Times* (July 25, 1950). Here he accused Bird of having been blinded by his evolutionary zeal and strong conviction that "no man ever existed in the age of reptiles" into rejecting the obvious—the contemporaneity of dinosaurs and man. "True science," Burdick wrote, "when divorced from evolution, gives powerful corroboration to the early history of man and the animal kingdom, as outlined in the Bible."

> If there ever was a superrace on earth capable of enjoying a utopian state, it was that which existed soon after its creation by a loving God. . . . With a withering earth we see a withering humanity. Not only has man decreased in stature from a magnificent specimen ten or twelve feet tall to an average of less than six feet, but his average life has shortened from many centuries to

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> little more than half a century. Where do we find any human evolution here? (page 6).

The film *Footprints in Stone* espouses the same explanation of those "giant man prints" that it claims are genuine. Taylor even enlisted the help of two modern human giants. Burdick must have been saddened at the sight of his utopia-man: the Chicago giant had an abnormally short and uncharacteristic stride and clearly experienced a lot of difficulty supporting his weight on his rather large feet. His feet were nevertheless too small to "fit" one of the "man prints." The second giant "fit" this impression better; he suffered bad edema and probably couldn't stand without considerable pain. (He was shown seated in the film.)

Burdick must have been most disappointed when Taylor's film crew from Illinois insisted upon filming only those "man prints" *in situ*, leaving his prized specimens unmentioned. Indeed, when Burdick appears as expert witness in the film, he voices some dismay that "erosion has removed the detail of the toes." The new discoveries were not as clear as the prints that, he believed, had been removed from the site years before.

Stanley Taylor and his crew were wise to omit Burdick's "clear" specimens, however, because they are anatomically wrong (Godfrey) and are admitted forgeries (according to the testimony of local residents). They were also recently exposed by creationists from Loma Linda University (Zuidema; see also Weber, "Paluxy Man—The Creationist Piltdown," p. 16-22).

The film *does* present testimonials of purported experts who came to Glen Rose from all over the country to see the "man prints." These testimonials make a strong impression on most film audiences. There are some skeptics, but on the whole the overwhelming response is positive: the experts have seen the "man prints" with their own eyes.

Here is where the film is most dishonest. Stanley Taylor apparently had enough faith in his belief that he was looking at real human footprints that he confidently highlighted the less-obvious features—toes, sometimes sides. However, he evidently did not have enough faith to invite to the scene a single vertebrate paleontologist, let alone a paleoichnologist (a specialist in studying tracks of extinct organisms). The film's "experts" included some well-known creationists; its skeptics were also creationists, but not young-earth advocates. The most enthusiastic testimonials came from Harold Slusher, Henry Morris, and Clifford L. Burdick.

The film is further dishonest in that it never mentions the extent to which the Cretaceous geologic strata at and around Glen Rose has been studied by paleontologists and the amount of remains of numerous species of reptiles and amphibians that have been discovered and described (for example, Langston). These strata simply do not contain a Cenozoic fauna.

In short, the film is a distorted pseudodocumentary, which belongs in the

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realm of science fiction rather than science. I am too much of a realist to think that all audiences will view the film with the sophistication exhibited by those at the colloquium. In fact, I believe that it is impossible to see the distortions without halting the movie every time an alleged human footprint appears. The eye *sees* the human shapes that have been painted on stone. It is easy to fool the human eye. Just ask any Hollywood special-effects artist.

Footnote

Although Bird never published these observations, he has left behind some indication that, by 1969, he had surmised what the old-timers had mistaken for human footprints. In a letter to creationist Mike Turnage, dated February 21, 1969, Bird wrote:

> They are definitely, repeat, definitely *not* human. I am well familiar with all the fossil footprints found in the Glen Rose (Cretaceous) of Central Texas, and have seen those purported to be "human" by farmers lacking any geologic training.
>
> They were made by carnivorous dinosaurs wading through deep mud. When the foot was withdrawn, the sides of the resulting cavity flowed inward leaving an oblong opening only faintly suggestive of the footprint of a man in the eye of the beholder. When one followed such a trail, tracks of the dinosaur were invariably found that showed all the details of a three-toed dinosaur.
>
> Anything else "human" exhibited or reported "found" in the area is the product of a very clever prankster with hammer and chisel.

John Morris, in *Tracking Those Incredible Dinosaurs: And the People Who Knew Them*, page 93, cites these words in an effort to discredit Bird.

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Tripping Over a Trilobite: A Study of the Meister Tracks

Ernest C. Conrad

On March 1, 1973, a creation-evolution debate was held at California State University in Sacramento. The creationist team consisted of Dr. Duane Gish of the Institute for Creation Research and Reverend Boswell of a local Sacramento church. The scientific team consisted of Dr. Richard Lemmon of the University of California at Berkeley and Dr. G. Ledyard Stebbins of the University of California at Davis. It was in this debate that I first learned of the Meister discovery. Reverend Boswell said:

> I have here something that pretty much destroys the entire geological column. I don't know if you can see this or not, but it has been studied by three laboratories around the world and it's *been tested and found valid.* If you can see it [holding up a picture], it represents a footprint that was found at Antelope Springs, Utah, while digging for trilobites.
>
> The man was digging for trilobites, and these are trilobites here and here embedded [pointing]. This is a brick mold of a trilobite footprint [laughter] of a human footprint with a trilobite in it. The man stepped on a living trilobite, [thus burying] him in the mud. This particular strata is dated Cambrian, supposedly 500 million years extinct before man arrived on the face of the

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> earth. The interesting thing about this photograph is that there is also heel marks, which would indicate that they were made by modern man.

What Reverend Boswell was declaring was that a fossil seeker, Mr. William J. Meister, had found a fossil of a human bootprint while hunting for fossils near Antelope Springs in 1968. Melvin Cook, telling the same story in an article in *Why Not Creationism?* reported that Meister opened up like a book two slabs of Cambrian rock and found embedded in them the print complete with the trilobite fossil. Kofahl and Segraves, two creationists who also wrote about the print, seemed to express some doubt in it and, in a photo caption, asked, "Is this print valid?" But Cook more boldly declared, "No intellectually honest individual examining this specimen can reasonably deny its genuine appearance."

After Meister found the original print, four other prints were discovered. Cook writes:

> Since Mr. Meister's interesting discovery, other persons have found similar but less-spectacular specimens in the same area, two of which have been shown to me.

From an article by Meister himself, we learn that the other "less-spectacular" specimens include three sandal prints and the print of a barefoot child found by Clifford Burdick. However, since these latter are not as convincing as Meister's bootprint and since none of the others have trilobites embedded in the soles, then it stands to reason that if the bootprint turns out to be false it is quite likely the others are as well.

Yet, the importance of this discovery, if genuine, is made clear by Kofahl and Segraves.

> According to evolutionary chronology, man did not appear on the scene until a half billion years after trilobites became extinct. If these prints prove to be valid, historical geology has another serious problem to solve.

Realizing the significance of this creationist claim and how it would lend support to their view that the earth is very young, I decided to investigate. During the question-and-answer period of the Sacramento debate, I asked Reverend Boswell what scientific evidence he had and what institutions established that the bootprint was real. He answered, "It was the University of Utah and U.C.L.A. and I have forgotten the third. These two are fairly academic institutions. They are familiar with the specimens."

Following his lead, I wrote to the Utah Museum of Natural History at the University of Utah—a "fairly academic institution." I received a letter in return which said:

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> The "footprint" in question was collected by a man named Meister several years ago, and it was immediately jumped on by Melvin Cook, who is *not* a paleontologist, as evidence of human-trilobite cohabitation.
>
> I have seen the specimen in question and it is nothing more than a slab of Wheeler shale that has a fragment spalled off in the form of a footprint, which reveals a trilobite, *Erathia kingi.*
>
> To reiterate, the trilobite is genuine, the footprint is not.

I was referred to an article by Professor William Stokes of the Department of Geological Sciences. Dr. Stokes wrote:

> I unhesitatingly assert that this is not a footprint. I have observed and collected a number of types of footprints that meet all the critical requirements, and I have had no qualms about describing these in print even though some were totally new. The Meister specimen is the result of a natural break, which happens to resemble a footprint. This type of fracture is called spalling and the part which breaks out or is detached is called a spall.
>
> The specimen was in no sense faked, and I am sure it was found exactly as reported. But I, along with my geologist friends, are equally sincere in my belief that it is an accidental natural product and *not a footprint.*
>
> One might think a difference of opinion such as this could be solved by appeal to impartial judges or by a more thorough investigation of the field of evidence. But from the time of discovery, the specimen has taken on a religious significance that makes a friendly solution almost impossible.

I did not contact the other "fairly academic institution," U.C.L.A, because I could see, by studying the creationist photograph of the alleged "bootprint," that it resembled a print only superficially, much as the "Man in the Mountain" in New Hampshire superficially resembles a human face. The sides of the print are unnaturally angular, and the whole print is unnaturally shallow. Cook even notes the shallowness, saying, "The heel print was indented in the rock about an eighth of an inch more than the sole." This doesn't make for a very pronounced heel. Calling it a "sandal print," as Kofahl and Segraves do, seems to excuse the heel, but, taken as a whole, Meister's discovery is one of the most superficial-looking "human footprints" that I have seen in creationist literature. It should come as no surprise that even creationists (like Kofahl and Segraves) show caution.

However, this does not silence the creationists who stand up for it. In debates and publications the "Meister tracks" are still used to show alleged flaws in geological science. Henry Morris's *Scientific Creationism*, for example, speaks of "human footprints in ancient trilobite beds."

The willingness of creationists to accept such shakey evidence in defense of their model has long historical roots. For example, in 1725 Dr. Johann Jacob Scheuchzer of Zurich seized upon some fossil bones of approximately human dimensions that were discovered at Oeningen and were sent to him for an opin-

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ion. Scheuchzer was intensely interested in anything that would help prove his theory that fossils originated largely through the work of Noah's flood. These bones seemed to help, so he declared that they belonged to *Homo Diluvii Testis* (Man Who Witnessed the Flood). However, nearly a hundred years later, the bones were found to be those of a large salamander. It was Cuvier, the famous French paleontologist, who offered the conclusive proof. Two petrified vertebrae, which Scheuchzer had found near Altdorf, Franconia, Germany, and believed to be further remnants of this "flood man," turned out to belong to the marine reptile ichthyosaur.

It remains to be seen how long certain modern creationists will cling to their own updated versions of *Homo Diluvii Testis.*

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Misquoted Scientists Respond

John R. Cole

> I never cease to be amazed at the skill with which Dr. Morris employs the writings of the top evolutionists themselves to develop an air-tight case against evolution. —Thomas G. Barnes

Creationists have developed a skill unique to their trade: that of misquotation and quotation out of context from the works of leading evolutionists. This tactic not only frustrates scientists but it misleads school board members, legislators, and the public. Whether such actions by creationists of selectively seeking out quotations or references in order to prove a preconceived case are willful distortion or the product of wishful thinking is irrelevant. Such acts misuse science and scientists in bogus appeals to authority. Creationists seem to be saying, "Don't just take *our* word for it—look at what Professor X has written to prove our case."

To respond to such arguments is difficult for anyone who is not working full time at checking every quotation or tracking down for comment each quoted person. Teachers, parents, policy makers, journalists, and other interested persons are therefore at a disadvantage, and it is for them that this anthology of responses from the scientific community has been compiled. Leading evolutionists in various fields were asked to comment briefly on misinterpretations of their areas of expertise and of their work. Most scientists who were approached replied, although a few cited other commitments that prevented their participation and a couple noted that they could not explain their position in just a few paragraphs.

Half of the following comments were especially written for this article, and the other half are from previously published material, excerpted with the authors' permission. Many topics—and scientists—are not included, but, as an introductory survey of scientists' responses to misquotation and misrepresentation by "scientific" creationists, it is hoped that this anthology will be useful as a representative sampling.

Dr. Richard Lewontin

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Modern expressions of creationism and especially so-called "scientific" creationism are making extensive use of the tactic of selective quotation in order to make it appear that numerous biologists doubt the reality of evolution. The creationists take advantage of the fact that evolutionary biology is a living science containing disagreements about certain *details* of the evolutionary process by taking quotations about such details out of context in an attempt to support the creationists' antievolutionary stand. Sometimes they simply take biologists' descriptions of creationism and then ascribe these views to the biologists themselves! These patently dishonest practices of misquotation give us a right to question even the sincerity of creationists.

Several examples of falsification can be found in a recent issue of *Acts & Facts*, published by the Institute for Creation Research, in an article written by Gary E. Parker, a member of the Institute and a teacher at Christian Heritage College in El Cajon, California. On page two we read that "As Harvard's Richard Lewontin recently summarized it, organisms '. . . appear to have been carefully and artfully designed.' He calls the 'perfection of organisms' both a challenge to Darwinism and, on a more positive note, 'the chief evidence of a Supreme Designer.' "

But the point of my article, "Adaptation" in *Scientific American*, from which these snippets were lifted, was precisely that the "perfection of organisms" is often illusory and that any attempt to describe organisms as perfectly adapted is destined for serious contradictions. Moreover, the *appearance* of careful and artful design was taken *in the nineteenth century before Darwin* as "the chief evidence of a Supreme Designer." The past tense of my article ("It *was* the marvelous fit of organisms to the environment . . . that *was* the chief evidence of 'Supreme Designer' ") has been conveniently dropped by creationist Parker in his attempt to pass off this ancient doctrine as modern science.

Later, on the same page, Parker says that "selection works fine—*if* a species has great genetic variability 'built right into it' by plan, purpose, and special creation." He then tries to support this point of view by quoting a statement of mine which said that selection can change organisms "only if their gene pool contains genetic variation" for the character in question. But it is precisely the *random* nature of the mutation process, the fact that species depend upon chance events in their history to acquire the genetic variation for evolution, that makes a successful response to the pressure of natural selection an uncertain process. Moreover, because populations and families are finite and sometimes quite small in size, mutations that could be selected may be lost to the population before selection has acted to incorporate them. To ascribe the *failure* of adaptation to deliberate design as creationists do is sheer perversity and illustrates why creationism is not science but blind prejudice.

On page four of Parker's paper is another quotation from my article on adaptation, stating that ". . . natural selection over the long run does not seem to

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improve a species's chance of survival but simply enables it to 'track,' or keep up with, the constantly changing environment." This is then alleged to support a conservative rather than a creative role for natural selection—a favorite theme of creationists, who admit minor evolution within species but no major changes. But the theory of environmental tracking (which I think is not a particularly good description of the evolutionary process) does *not* say that the form and function of species is kept constant. What is conserved is the life of the species, but this conservation is made possible by continual change, sometimes quite radical, in the form and function of the organisms as they track an environment that is itself changing in sometimes quite radical ways. Here the creationist has simply played with the meaning of words.

Because of errors and misquotations of this nature, scientists and educators must clear away a great deal of confusion in the public mind about the true nature of evolutionary science. Confusion that wouldn't be there if it hadn't been created by creationists.

Dr. Niles Eldredge

Curator, Department of Invertebrates, American Museum of Natural History, and coauthor with Stephen Jay Gould of the papers on the theory of punctuated equilibria that initiated the past decade's revolution in paleontology and evolutionary theory.

It is particularly galling to one who labors in the vineyards of evolutionary biology to hear a candidate for the presidency of the United States declare, when asked about evolution, "Well, it is a theory, it is a scientific theory only, and it has in recent years been challenged in the world of science and is not yet believed in the scientific community to be as infallible as it once was believed." Nonsense. No active geneticist, embryologist, systematist, anatomist, or paleontologist doubts that life has evolved. What such biologists *do* argue about is *how* life has evolved.

All science involves the search for better explanations. We are currently entering a period of renewed intensity in our search to understand the mechanisms of the evolutionary process. For the past forty years or so, evolutionary thinking has been dominated by a single, simple, and rather elegant notion: that natural selection, tracking environmental change, modifies organisms' adaptations. The "synthetic theory of evolution" claims that this process accounts for all of evolutionary history. Still the dominant view held today, this synthesis marks an unusual period of virtual agreement within the entire field of biology. Many biologists in different disciplines are now openly skeptical that adaptation via natural selection alone can really account for all aspects of the evolution of life's diver-

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sity. Scientists see this as a healthy sign; debates over the relative merits of conflicting ideas are the heart and soul of science. Creationists, taking the synthetic theory as a synonym of "evolution," conclude from the debates that biologists are no longer wholeheartedly sure that life has evolved. Hence Ronald Reagan's remark.

As an example, the notion of "punctuated equilibria," which Stephen Jay Gould and I began discussing in the early 1970s, is commonly cited in creationist literature as evidence that evolution has *not* occurred. Among other things, the notion of punctuated equilibria accounts for the *lack* of change seen in most fossil species as they persist through, in some cases, several millions of years. We questioned the long-held belief that evolutionary change must be slow, steady, gradual, and inevitable—a view that goes back to Darwin himself. We claimed, instead, that evolution preceeds by fits and starts, mostly in conjunction with events surrounding the origin of new species. Creationists argue that, inasmuch as fossil species do not change much once they appear, the very notion of evolution is itself falsified. But Gould and I were only doing what scientists always do: testing predictions against real evidence. We found that the evidence failed to support the notion that evolutionary change in general is slow and gradual. We then offered an alternative explanation that, for the moment, seems to us to fit the evidence better. We never concluded that life did not evolve, but merely that it did not evolve exactly the way that Darwin said it did. Our data agree perfectly with the general notion that life *has* evolved.

There are today but two explanations of the pattern similarity interconnecting all forms of life: all organisms share RNA and all vertebrates share backbones and other structures. All mammals have three inner ear bones and mammary glands. How do you explain this pattern of nested similarities? The creationists see this pattern and explain it as the manifestation of a supernatural creator's blueprint. Biologists see the pattern and note that "descent with modification" would also yield the same patterns. How do we choose between these two explanations of the same evidence?

Biologists say that, *if* evolution has occurred, there should follow some predictions about living creatures. I'll give two of the several general consequences of the notion of evolution. First, we would predict that there must be one (not several or many) single, coherent pattern of similarity linking all forms of life together. This prediction is tested daily by systematists seeking to classify the ten million or so fossil and living species. They predict that distributions of anatomical and behavioral features should yield one single pattern. And this is what they find: one single pattern.

Here is another general prediction from the basic notion of evolution: if evolution has occurred, there should be a regular change in the appearance of life as one goes further back in the fossil record. Progressively earlier forms within a group (for example, the horse family) should look more and more like the early

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representatives of other closely related groups. They do. The Eocene "dawn horse" looks far more like an Eocene rhinoceros than it resembles a modern race horse. And so on. Predictions about laboratory changes in gene frequencies and patterns of differentiation leading to new species is testable and has survived all serious attempts to refute it.

Creationists, on the other hand, make no predictions about patterns of nature that *must* be there *if* all of life was fashioned separately by a creator. They cannot. It is their position that whatever patterns we see, that's what the creator made. Thus, there is no way they or anyone else can test creationist notions by consulting nature. One must take creationism on faith alone. "Scientific" creationists purport to test (and always refute!) hypotheses from geology and biology —never hypotheses drawn directly from creationism as a part of science. Yet these same creationists later say that neither creation nor evolution belongs in the realm of science. Both positions are wrong. Evolutionary biology is as much a part of science as nuclear physics; creationism is not a part of science at all.

Thus, the choice boils down to a preference for human understanding of the universe through that unique interplay of thought and experience we call *science* versus an acceptance of authoritarian revealed truth. Evolution and creationism both explain life's diversity, but only evolution belongs in a science curriculum.

Dr. Stephen Jay Gould

Professor of geology, Harvard University; author of The Panda's Thumb*; and probably the single most misquoted and misused scientist among the creationists' unwilling allies. This exerpt is from "Evolution as Fact and Theory,"* Discover, *May 1981.*

It is infuriating to be quoted again and again by creationists—whether through design or stupidity, I do not know—as admitting that the fossil record includes no transitional forms. Transitional forms are generally lacking at the species level but are abundant between larger groups. The evolution from reptiles to mammals . . . is well documented. Yet a pamphlet entitled "Harvard Scientists Agree Evolution Is a Hoax" states: "The facts of punctuated equilibrium, which Gould and Eldredge . . . are forcing Darwinists to swallow fit the picture that [William Jennings] Bryan insisted on and which God has revealed to us in the Bible."

Dr. David M. Raup

Dean of Science, Field Museum of Natural History in Chicago; "punctuationalist" whose writings, along with those of Gould and Eldredge, are among the most

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influential contributions to that theory and among those cited by creationists in an attempt to bolster their case.

One of the most unfortunate aspects of the current creation-evolution debate is that many of the creationists equate Darwinian theory with evolution. They are saying, in effect, that if Darwin's theory falls, then so does evolution. Nothing could be further from the truth. To me, there are two basic questions: Has evolution occurred (in the sense of change in the biological composition of the earth over millions of years)? By what mechanisms has evolution occurred? Darwin's contribution was to the second question. He proposed a biological mechanism: natural selection. Whether Darwin was right or wrong has no bearing on the question of whether evolution did or did not occur.

On the question of whether or not evolution has occurred, I would say that there are few things in the natural sciences about which we can be more confident. The geologic time scale has been checked and rechecked by many independent methods. Although individual dates may be subject to error, the overall chronology stands firm. It is used every day in petroleum and mineral exploration, and, if there were basic problems with it, I am sure that industrial geologists would have blown the whistle. The fossil record is intimately tied in with this chronology and shows a record of change in organisms through time. What we are not sure about is just how the biological changes took place. Natural selection surely played a part, but there may be other biological processes that have operated. One of the challenges of biology and paleontology is to find out what other processes were involved.

Dr. Laurie Godfrey

Assistant professor of anthropology, University of Massachusetts at Amherst, and editor of two forthcoming books, A Century After Darwin *and* Scientists Confront Creationism. *As a specialist in human and primate evolution, she is particularly concerned with creationist misrepresentations of the literature on human evolution.*

On April 10, 1981, creationist Dr. Allen Beeber presented a slide show and lecture on scientific creationism at the University of Massachusetts. Although it was ill-received (largely because of its inadequate science), it is worth notice because it illustrates so well the techniques of creationists.

Beeber's doctorate in polymer science seemed impressive at first, but it turned out that there was no polymer science in his presentation. Indeed, Beeber had neither assembled the slide show nor written much of the text. The source of his slide show was John Baungardner of Canoga Park, California. It was a

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"canned" presentation and, judging from the misuse of data in anthropology, geology, biology, physics, and mathematics, it was clear that the author or authors lacked familiarity with much of the material cited. This was certainly true of Beeber, who admitted not having read sources quoted in his arguments.

Distorting information in my own field, Beeber led the audience to believe that *Australopithecus* was probably, according to anthropologist Charles Oxnard, some kind of orangutan (or, at least, *like* an orangutan), that anthropologist Clifford Jolly had demonstrated that fragmentary *Ramapithecus* was probably some kind of baboon, and that Richard Leakey had shown that ER 1470 was essentially a modern human.

These are standard creationist arguments, mirrored, for example, by Dr. Gish in his book, *Evolution: The Fossils Say NO!* Gish argues on page 103 that Clifford Jolly uncovered "devastating evidence against the assumption of a hominid status for *Ramapithecus*" and that *Ramapithecus* was at best a monkey-like ape or, perhaps, a "monkey with diet and habitat similar to that of galada [*sic*] baboons." He quotes Charles Oxnard as saying that *Australopithecus* was a unique form but, "to the extent that resemblances exist with living forms, they tend to be with the orangutan." Gish adds, "Oxnard's conclusions are that *Australopithecus* is not related to anything living today—man or ape—but was uniquely different" (p. 12). Gish asserts that modern *Homo* was around all along, stating that Richard Leakey has found a skull of an individual contemporaneous with *Australopithecus* (ER 1470), which is "almost indistinguishable from those of many individuals living today" (p. 136).

This represents a gross distortion of what Jolly, Oxnard, and Leakey actually said. Jolly cited dental parallelism between the baboon *Theropithecus gelada* (which feeds on small hard objects such as grass corms and seeds) and early hominids in an attempt to reconstruct the diet of the extinct forms. But neither Jolly nor any anatomist would ever confuse the mouth of a baboon with that of a hominid such as *Ramapithecus* (nor any other fossil genus with small front teeth and large cheek teeth, such as the lemur *Hadropithecus* or hominid *Australopithecus*). Nowhere did Jolly even remotely imply that *Ramapithecus, Australopithecus, Hadropithecus,* or *Homo* are baboons.

Oxnard similarly never implied that *Australopithecus* is unrelated to any animal living today. Instead, Oxnard argued that late Pliocene and early Pleistocene *Australopithecus* was not directly ancestral to *Homo erectus* but shared a more remote common ancestor with an earlier variant of the genus *Homo*. He further argued that *Australopithecus*, while facultatively bipedal, probably engaged in climbing activities as well. His research question was functional: Was *Australopithecus* a habitual bipedal? His analysis was based entirely on some postcranial fragments. Oxnard readily acknowledged the shared dental and cranial features of *Australopithecus* and *Homo* (signs of their common ancestry). He explicitly argued that the postcranial resemblances of *Australopithecus* to orangu-

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tans imply functional similarities, not a closer relationship of *Australopithecus* to *Pongo* (the orang) than to *Homo.*

In conclusion, Gish's allegations concerning ER 1470 are a bit mysterious, since ER 1470 has a face similar to that of robust australopithecines and a cranial capacity little more than half that of the average modern human. The creationist slide showed it in front view, not profile, probably because in profile this "strikingly modern" skull looks far more like other specimens of early *Homo* and *Australopithecus.* Leakey describes ER 1470 as a member of the lineage (*Homo habilis*) ancestral to *Homo erectus*, in turn ancestral to *Homo sapiens* (modern man). Some of the hooplah surrounding the discovery of ER 1470 was based on the unexpected presence of a 2.5 million-year-old hominid with a cranial capacity fo 800 cc. Leakey publicized the great antiquity of his relatively large-brained discovery with great showmanship. The redating of ER 1470 at less than two million years makes this find far less remarkable than originally hailed. In any case, Leakey never considered it a member of the modern human race.

In spite of these facts, Beeber used this skimpy creationist "review" of the hominid fossil record, plus the well-known Piltdown hoax and the pig tooth once briefly mistaken for that of a hominid ("Nebraska man"), in an attempt to destroy the credibility of the human fossil record. Such arguments have worked well on audiences unfamiliar with the data, but they did not succeed at the University of Massachusetts.

Dr. Isaac Asimov

Author of 232 books and professor of biochemistry at Boston University School of Medicine. His popular writings which explain the workings of the second law of thermodynamics have been widely quoted from by creationists. This response is excerpted from "The Threat of Creationism," which appeared in the June 14, 1981, issue of New York Times Magazine, *and reprinted with permission.*

Creationists, in recent years, have stressed the "scientific" background of their beliefs. They point out that there are scientists who base their creationist beliefs on a careful study of geology, paleontology, and biology and produce "textbooks" that embody those beliefs.

They have learned enough scientific terminology to use it in their attempts to disprove evolution. They do this in numerous ways, but the most common example, at least in the mail I receive, is the repeated assertion that the second law of thermodynamics demonstrates the evolutionary process to be impossible.

In kindergarten terms, the second law of thermodynamics says that all spontaneous change is in the direction of increasing disorder—that is, in a "downhill" direction. There can be no spontaneous buildup in the complex from the simple,

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because that would be moving "uphill." According to the creationist argument, since, by the evolutionary process, complex forms of life evolve from simple forms, that process defies the second law, so creationism must be true.

To lift the argument a notch above the kindergarten level, the second law of thermodynamics applies to a "closed system"—that is, to a system that does not gain energy from without, or lose energy to the outside. The only truly closed system we know of is the universe as a whole.

Within a closed system, there are subsystems that can gain complexity spontaneously, provided there is a greater loss of complexity in another interlocking subsystem. The overall change then is a complexity loss in line with the dictates of the second law.

Evolution can proceed and build up the complex from the simple, thus moving uphill, without violating the second law, as long as another interlocking part of the system—the sun, which delivers energy to the earth continually—moves downhill (as it does) at a much faster rate than evolution moves uphill.

Unfortunately, the second law is a subtle concept that most people are not accustomed to dealing with, and it is not easy to see the fallacy in the creationist distortion.

Dr. Ashley Montagu

Physical anthropologist at Princeton University and renowned author. He summarizes below the attitude of the scientific community toward the general theory of evolution.

Regarding the recent action brought by the creationists in California and the judge's order that the state distribute more copies of a statement of long-standing policy that evolution should not be taught as dogmatic, irrefutable fact but rather as a scientific theory, the truth is that evolution is an unrefuted fact. There are theories concerning the exact mechanisms of evolution, but concerning evolution there no longer can be any doubt as to its reality.

The method of science is falsification, the attempts to disprove by every possible means the theory which appears to explain the fact. If the attempt fails, the scientist knows that he has something and proceeds to set up experiments to further test the theory. When the results support the theory, they are published so that other scientists can check them. When the findings are verified, we have "irrefutable" proof of the accuracy of the theory. In that sense, truth for a scientist means the highest degree of probability attached to a particular judgment.

In that same sense, because we have innumerable evidences of the reality of evolution, both of a premeditated and unpremeditated (natural) experimental kind, evolution is no longer a theory but one of the best authenticated facts within

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the whole realm of science. The fact of evolution is beyond dispute.

Theories as to the exact mechanisms of evolution are (happily) alive and being debated—such debate constitutes the lifeblood of science, not evidence of disagreement as to the fact of evolution. The scientist believes in proof without certainty; some other people believe in certainty without proof.

Not all things can be proven; evolution can. Creation myths are just that: myths. As such, they are the legitimate study of anthropologists and folklorists. If some people choose to believe them to be truths, they are free to do so.

Conclusion

The foregoing statements should lay to rest some of the claims that leading "authorities" in science are lending support to antievolutionary arguments or that evolution is no longer accepted by the scientific community. There is no "club secret" that evolution is "bankrupt" or that the theory is "crumbling," as many creationists have charged.

It is easy to see how, with effort and a single-minded search through scientific literature, one can locate sentences and passages in anyone's work that can be interpreted out of context to mean whatever one desires. By this same method, some people read into the Bible proof that "ancient astronauts" visited earth.

Instead of searching for quotations, creationists should test their ideas against empirical evidence. The results of such tests, if carefully performed, can then be submitted to the peer review of the scientific journals. Scientists reading the results can duplicate the experiments or recheck the data. If they disagree, their positions will also appear in the journals. Scientists normally disagree with and test each other's ideas. This is the nature of science. But when the Moral Majority's Jerry Falwell promises that students at his Liberty Baptist College will never find differences of opinion among faculty members and that "anytime they start teaching something we don't like, we cut the money off" (Fitzgerald), he promises the opposite of science.

Still, it is easy to see how anyone wedded to such a dogmatic view would find the dynamics of scientific argument and counter argument a kind of proof that scientists now dispute evolution. Absolutist searchers for chinks in the evolutionists' armor miss the point of science and project their either-or values onto it. They therefore see certain scientists as "authorities" who can be used to champion their views.

Arguments from authority are logically weak. A position does not stand or fall depending upon who endorses it. It is the evidence and its logical interpretation that tell the tale. Even if creationists quote an individual more or less correctly, this does not support their position.

One example, in particular, of near-correct quotation involves philosopher

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Sir Karl Popper. In 1976 Popper said, "Darwinism is not a testable scientific theory but a metaphysical research program." But Popper is not an expert in the biological sciences or their history. Furthermore, he is not the only philosopher of science in the world with anything to say on the subject of evolution. Philosophers often disagree with each other more than scientists do. And, to top it off, Popper has recently changed his mind on his earlier pronouncement against evolution. In 1978 he wrote, "I have changed my mind about the testability and logical status of the theory of natural selection, and I am glad to have the opportunity to make a recantation." Popper, much earlier than 1976, had had even stronger criticisms of evolution. But as early as 1972 he wrote:

> I blush when I have to make this confession; for when I was younger, I used to say very contemptuous things about evolutionary philosophies. When twenty-two years ago Canon Charles E. Raven, in his *Science, Religion, and the Future*, described the Darwinian controversy as "a storm in a Victorian teacup," I agreed, but criticized him for paying too much attention "to the vapors still emerging from the cup," by which I meant the hot air of the evolutionary philosophies (especially those which told us that there were inexorable laws of evolution). But now I have to confess that this cup of tea has become, after all, *my* cup of tea; and with it I have to eat humble pie.

Popper then proceeded to restate Darwin's theory in a manner that was logically consistent, feeling that Darwin and other evolutionists had not done the best job nor used the right words to express the theory.

We can see, then, that not only is disagreement between scientists a natural part of the scientific enterprise but scientists and philosophers are capable of changing their minds. Creationism, on the other hand, tries to be the same "yesterday, today, and forever." It is therefore not a science, and citations, quotations, and details lifted out of context do not magically make it so.

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News Briefs from the Editor

Arkansas

The American Civil Liberties Union is challenging the creation bill which was passed in Arkansas. The case is slated to go to court on December 7, 1981. Wendell Bird, the leading author of the Arkansas law, along with other leading creationists (including Henry Morris, Duane Gish, and Harold Coffin) originally sought to participate in the state's defense. However, Arkansas Attorney General Steve Clark has told the creationists that he doesn't want their help. The creationists have established a "Creation Science Legal Defense Fund" and were planning a big showdown; they wanted the merits of creationism to be presented before the judge who will try the case. Judge Overton ruled against their motion to intervene, while at the same time turning down a request from the Unitarians to file a friend-of-the-court brief which defends evolution and states the Unitarian opinion of the law. These decisions might mean that the primary emphasis of the case will be on evolution and constitutional law rather than on religion.

Meanwhile, the ACLU is gathering together a group of expert scientists and educators to aid in the suit. They are prepared for whatever sort of case this may turn out to be.

Louisiana

On July 21, 1981, a creation bill similar to that in Arkansas was signed into law in Louisiana. The wording of the two is almost identical, as both are from the same draft pushed by Paul Ellwanger's Citizens for Fairness in Education. The Louisiana law, however, leaves out the specific definitions of creation-science and evolution-science. (This is actually more sensible, because science is not a dogma that can have its conclusions engraved into the immutable bronze of a statute.) The Louisiana law also adds a provision stating that the governor may designate seven creation scientists "who shall provide resource services in the development of curriculum guides." Unlike the Arkansas law, this law affects teacher-training institutions as well as secondary schools.

In Governor Treen's public statement defending his signing of the bill, he indicated that the law simply *permits* the two theories to be covered; it does not mandate anything. However, recognizing that the wording in this part of the law is ambiguous and may end up meaning that creationism will be required whenever evolution is taught, Treen opined that this would not damage science education. "Academic freedom can scarcely be harmed by *inclusion*; it can be harmed by *exclusion*," he said. But if this is literally true, why does the bill exclude all other

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pseudoscientific theories from consideration? And, since Louisiana never required the teaching of evolution in the first place, what is the need for a law that "permits" the teaching of creationism?

Don McGehee, the state education official, has determined that the new law will cost Louisiana $7 million. This will go to pay for creationist library and textbooks as well as teacher training.

The ACLU is committed to bringing a lawsuit challenging this bill also, but the timing is a bit uncertain. The Arkansas bill was challenged two months after it was signed into law, and it will probably take as long to make the legal moves regarding the Louisiana case.

Federal Legislation

Congressmen from Kentucky, Tennessee, Arkansas, Louisiana, and other states have recently been approached about introducing a *federal* creationist bill in Washington. The bill is another model piece of legislation, this time being pushed by Citizens Against Federal Establishment of Evolutionary Dogma. Who heads this group? You guessed it: Paul Ellwanger. The federal bill is called "An Act to Protect Academic Freedom and to Prevent Federal Censorship in Scientific Inquiry Funded with Federal Tax Monies." It's main thrust is to ensure that, whenever federal funds are provided for evolution research, curriculum development, museum exhibits, or exhibits and lectures connected with the National Park Service, equal funds must be applied to creationism in these same areas. This would probably mean, for example, that tour guides in our national parks would have to include a creationist interpretation of each natural wonder that they explain. The repercussions would be enormous. National Science Foundation General Counsel Charles H. Hertz has said that such a law "could severely distort the allocation of federal monies, introduce factors extraneous to scientific research, and itself constitute a form of subtle federal censorship of academic research." Pressure is nonetheless building in Congress at this time and Ellwanger has declared that such a bill will appear very soon.

State Legislation

Paul Ellwanger has had his model state bill introduced so far in twenty-one legislatures and is now in the process of completing a second revision of it. He expects that after January it will appear in about nineteen states. The original tactic used by creationists to push the model bill was to first stir up a public outcry and then, with all that hoopla and support, try to force the bill through the legislature. However, in every case where that tactic was tried, concerned scientists, religious

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leaders, educators, parents, and others against creationism became alarmed. They were often mobilized by Committees of Correspondence. The result was that they were able to use the time to organize an effective opposition. The creationists were stunned to see how large that opposition was. In response to their repeated failures, the creationists adopted a new tactic: "springing" bills. They began to keep quiet about proposed legislation until the last few days of the legislative session and then tried to rush it through before anyone heard about it. This tactic worked in Arkansas and Louisiana. We expect to see it in use again in 1982.

Is there an effective antidote to this new tactic? Yes, but it requires foresight. It had been wise in the past to "let sleeping dogs lie" and not raise the creation controversy in a state until the creationists did. But now, those opposed to such legislation must raise the issue early by writing to their state legislators and local school boards to inform them of the facts well in advance of any possible vote. Legislators should know there is an organized opposition to creationism *before* it becomes an issue. Copies of articles in *Creation/Evolution* can be sent to key people who need to be informed. Individual letters need to be written. Letters to the editor should appear in newspapers. There is no way of telling which states will be next. The time to act is now.

Committees of Correspondence to fight creationist legislation have been established in thirty-five states. If you desire to take part in the effort, write to Stanley Weinberg, Committees of Correspondence, in care of this journal. The Committees of Correspondence network will be involved in three presentations at the AAAS Annual Meeting in Washington, D.C., January 3–8.

California

The Creation-Science Research Center is at it again. Nell Segraves of the Center is fighting to get Isaac Asimov's book, *In the Beginning*, taken off public school library shelves in San Diego City Schools. Segraves argues that the book is "anti-God and anti-Scripture and makes the Bible out as mythology." She adds that creationist books are not in these school libraries. "We have a law in this state that allows the Bible to be used as a resource book, but it does not allow commentary on the Bible," Segraves declared. But if this is true, she should be fighting *against* such a law, not *for* censorship. If creationist books are not included in public school libraries, she should fight to get them in—not get Asimov out. There is no harm in exposing high schoolers to a variety of religious viewpoints. If books on astrology appear in San Diego City School libraries (and they do), then books on almost any harmless opinion should appear with them. It seems Segraves does not agree with Louisiana's Governor Treen in his view that "exclusion" alone is harmful. So long as religious materials are not made part of the science curriculum, there should be no bar to their inclusion in the public schools.

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Teaching *about* religion, as opposed to preaching, is quite legal.

Kentucky

Dr. William E. Ellis, an Eastern Kentucky University history professor, has polled Kentucky's high school biology teachers and found that they are overwhelmingly in opposition to being forced to teach scientific creationism. Out 794 questionnaires sent out, 44 percent were returned. Of those, 76 percent showed opposition to any state law forcing "equal time" for creationism. Slightly over half of the responding teachers said that they moderately emphasize evolution in their classes, and one-third said that they give it little emphasis. A majority said that, while they frequently encourage students to offer opposing views to evolution, the students do so only "very rarely" or "occasionally." Nearly 80 percent said that they have never had any negative reactions from parents about teaching evolution, and over 90 percent said that they never had complaints from either school administrators, the superintendent, or the school board. A majority supported the view that they alone should make any decision on which theories will be emphasized in their classrooms. It appears that this survey is the first of its kind that has covered the entire state.

Michigan

Professor John N. Moore, a founder of the Creation Research Society, has accepted early retirement from Michigan State University. For more than a decade Moore has taught "two model" science in his classes. He also coauthored the controversial text, *Biology: A Search for Order in Complexity.*

Oregon

An error was made in *Creation/Evolution V*. It was stated that the petition filed in Grants Pass, Oregon, was for a statewide referendum on teaching creationism. It was actually for only a local referendum. The result, however, was the same as for the earlier and similar petition drive in the Medford area: it failed. Petitioners canvassed door-to-door in Grants Pass in an attempt to gather the 1,994 signatures needed in order to put an "equal time" measure on the ballot but were only able to get about 1,000. Their desire was to have scientific creationism taught in the district's schools on an equal basis with evolution. Petitioner Phil Hyatt said, "We got very poor response and we came considerably short, so we are going to discontinue the efforts. It seems like the people are not interested in getting in-

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volved in it." This result surprised the creationists, who had felt sure they would have no difficulty.

Virginia

Evangelist Jerry Falwell moderated a debate between creationist Duane Gish of ICR and Dr. Russell Doolittle of the University of California at San Diego, to be aired during prime time on a nationwide television hookup. The contract gives Doolittle some control over the tape and limits Falwell's right to use it as a medium for creationist publicity. The taping took place on October 15, 1981, at Falwell's Lynchburg, Virginia, church and will be broadcast first over the Christian Broadcasting Network before the end of this year. Doolittle previously debated Gish at Iowa State University with considerable success; however, the results of the latest confrontation were not so positive.

FORTHCOMING SYMPOSIA CONTINUED FROM INSIDE FRONT COVER

Michigan Science Teachers Association Annual Conference. February 13, 1982, at Everett High School, Lansing, Michigan. A session will be devoted to the teaching of evolution, emphasizing such creationist stress-points as radiometric dating, natural selection, and the human fossil record. Contact Carl Bajema, Loutit Hall of Science, Grand Valley State College, Allendale, MI 49428, (616) 791-9010.

University of Richmond, Richmond, Virginia. February 20, 1982. This all-day symposium is being sponsored jointly by Sigma Xi and the Biology Department. It is aimed at teachers, legislators, and the general public. The purpose is to update the audience on the current status of the controversy, relate recent developments in evolutionary biology, review "the positive evidence for evolution," discuss the role of evolutionary biology in the public school curriculum, and explain the relationship of evolution to religion. Wayne Moyer will be the keynote speaker. Contact Thomas Platte, (804) 285-6275.

Haverford College, Haverford, Pennsylvania. February 27–28, 1982. Contact Ariel Loewy, (215) 896-1000.

Pacific Division of AAAS. June 1982 in Santa Barbara, California. An all-day symposium, called "Evolutionists Confront Creationists," will feature papers by prominent creationists with responses by various specialists. The proceedings will be published. Contact Frank Awbrey or William Thwaites, Biology Department, San Diego State University, San Diego, CA 92182, (714) 265-5365.

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